7

WATER QUALITY AND THE ENVIRONMENT: CRITICAL COMPONENTS OF WATER MANAGEMENT

If water planners and managers in the Weber River Basin are to effectively meet future water needs, they will need to do more than simply provide adequate water supplies and delivery systems. The water supply decisions they make can greatly impact water quality, the environment and recreation. For the most part, water planners and managers are aware of these impacts and are working to develop plans and strategies that will protect these important values; however, there is still much that could be done. This chapter discusses in detail the importance of water quality and the environment to the management of the Weber River Basin's water resources, and it also elaborates some of the things being done to safeguard these important values.

WATER QUALITY

Regulation of water quality in Utah began in 1953 when the state legislature established the Water Pollution Control Committee and the Bureau of Water Pollution Control. Later, with the passage of the federal Clean Water Act in 1972 and the federal Safe Drinking Water Act in 1974, strong federal emphasis was given to preserving and improving water quality. Today, the Utah Water Quality Board and Division of Water Quality, and the Utah Drinking Water Board and Division of Drinking Water are responsible for the regulation and management of water quality in the state of Utah.

As a result of these agencies and regulations, residents of the Weber River Basin enjoy safer water systems than the basin's early settlers. However, due to the magnitude of growth and development that is projected to occur and the increased pollution loads that this growth will bring, the Weber River Basin will continue to

face some serious water quality challenges. Water resource planners and managers within the basin need to be increasingly aware of these issues and work closely together to satisfy future water quality needs.

The State Water Plan identified six water quality programs or concerns that are of particular importance to the future of the state's water resources. These are also of concern to the Weber River Basin and are as follows:

- Total Maximum Daily Load program
- Preservation and restoration of riparian and flood plain corridors
- Storm water discharge permitting
- Nutrient loading
- Concentrated animal feedlot operations
- Septic tank densities

Each of these topics is discussed below with emphasis given to how they affect the water resources of the Weber River Basin. A brief discussion of ground water contamination at Hill Air Force Base is also included.

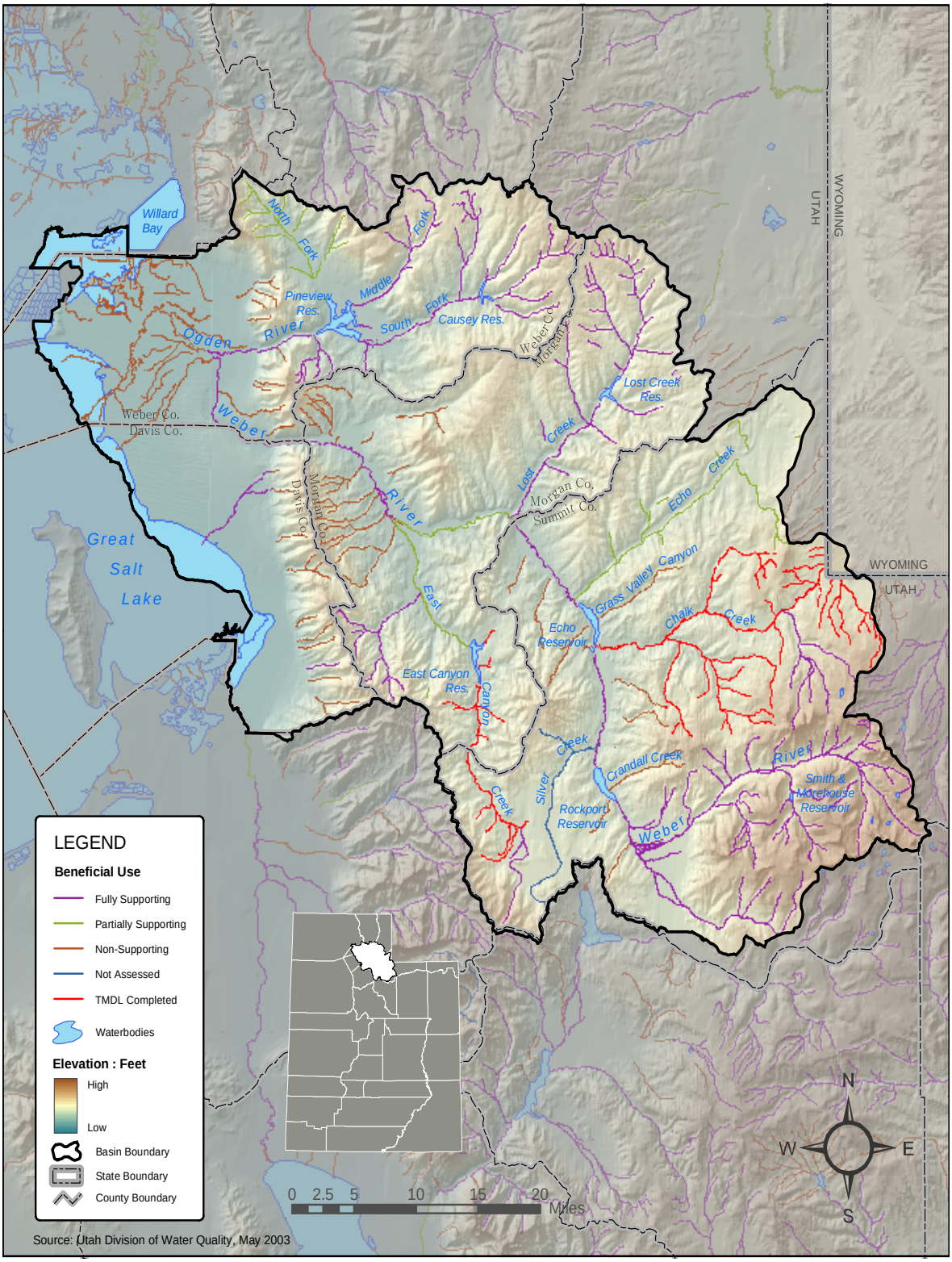
Total Maximum Daily Load Program

Section 303 of the Clean Water Act directs each state to establish water quality standards to protect beneficial uses of surface and ground water resources. The Act also requires states to identify impaired water bodies every two years and develop a total maximum daily load (TMDL)[1] for each pollutant causing impairments in the various water bodies.

The Division of Water Quality (DWQ) has identified stream segments that are fully supporting, partially supporting or not supporting their beneficial uses that are in the Weber River Basin (see Figure 11). Table 21 lists all the impaired water bodies for which TMDLs are required, the pollutant or nature of impairment, and the status of the TMDL. In cooperation with state, federal and local stakeholders, DWQ is organizing and facilitating locally led watershed groups to establish TMDLs for each of the impaired water bodies. Below is a brief description of the TMDLs that have been approved to date and the progress that has been made in these areas.

FIGURE 11

Water Quality Impairments and Beneficial Use Support Assessment



Chalk Creek TMDL

The Chalk Creek Watershed has an established group of stakeholders that has worked together for several years to improve water quality. This watershed group produced a Coordinated Resource Management Plan that was submitted to EPA as a TMDL. This plan was approved by EPA and has served as the foundation for countless watershed projects that have been completed on Chalk Creek and its tributaries. These programs have been well received by local residents and have already had a positive impact on water quality and the total stream environment. As of spring 2003, $3.2 million dollars had been spent on various projects, with 40 percent of that amount coming from many of the 90 private land owners involved. Thus far, these efforts have stabilized stream banks and improved the riparian habitat along 15 stream miles, and reduced sediment entering Echo Reservoir from Chalk Creek an estimated 70,000 tons per year.[2]

TABLE 21
TMDLs in the Weber River Basin

Water Body	Pollutant(s) or Stressor(s)	TMDL Status	Project Implementation Plans Due
Chalk Creek	Sediment Total phosphorus Stream habitat loss Riparian habitat loss	Approved 10/23/97	April 2006
East Canyon Creek	Total phosphorus Dissolved oxygen	Approved 5/23/00	April 2006
East Canyon Reservoir	Total phosphorus Dissolved oxygen Temperature	Approved 5/23/00	April 2006
Echo Creek	Sediment	Due 4/1/05	April 2009
Echo Reservoir	Total phosphorus Dissolved oxygen	Due 4/1/05	April 2009
Pineview Reservoir	Total phosphorus Dissolved oxygen	Approved 12/1/02	April 2008
Silver Creek	Zinc Cadmium	Submitted 4/1/04	April 2009

Sources: Utah Division of Water Quality, "Total Maximum Daily Load Long Term Schedule," revised 16 April, 2002; and Weber River Watershed Coalition, *Weber River Watershed Restoration Action Strategy,* (Salt Lake City: Utah Division of Water Quality, 2003), 39.

East Canyon Creek and East Canyon Reservoir TMDLs

East Canyon Creek and East Canyon Reservoir have TMDL plans that have been completed. The East Canyon Creek TMDL has the goal to reduce total phosphorus above and below the wastewater treatment plant, maintain a healthy level of dissolved oxygen in the water and reduce macrophyte growth by 50 percent

or more. The East Canyon Reservoir TMDL has similar goals that will preserve the quality of the water in the reservoir to meet all of its beneficial uses. To accomplish these goals, sediment and phosphorus loads will be reduced from the following sources: Snyderville Basin Wastewater Treatment Plant, urban runoff, construction activities, agricultural activities and the riparian corridor.[3]

At the end of 2002, the Snyderville Basin Water Reclamation District completed a renovation of their wastewater treatment plant to limit the amount of phosphorus in their effluent. With this new facility online, the District has helped East Canyon Creek meet the state standards for total phosphorus throughout 2003 event though extremely low flows plagued the creek during the summer. Despite the lower flows entering East Canyon Reservoir, which is also impaired for phosphorus, water quality there is also showing signs of improvement, especially in the reduction of toxic algae growth.

The Utah Association of Conservation Districts is also assisting DWQ with coordinating several efforts within the watershed to further reduce nutrient and sediment loads in the watershed, these include:

- Helping various landowners along the river improve access to streams and control streambank erosion.
- Educating ski resort and golf course owners and operators on the importance of proper watershed management.
- Assisting ranchers and animal feedlot operators to implement protective measures.
- Helping Park City and Summit County develop storm water management programs to control urban runoff and minimize erosion from construction sites.

Preservation and Restoration of Riparian and Flood Plain Corridors

Many riparian zones adjacent to the Weber River and its tributaries have been severely impacted by development that has occurred in their corresponding flood plains. As the basin's human population increases, additional riparian and flood plain corridors are in jeopardy. Improper stream bank modification and channelization (often referred to as habitat alteration and hydrologic modification) are the cause of many water quality impairments in the Weber River Basin's streams. In 2000, DWQ estimated that these stream

modifications affected about 19 percent of the basin's stream miles and were a source of nearly 32 percent of the basin's stream water quality impairments.[4]

County and city planners and commissions need to work together to preserve riparian zones and flood plains from unwise development. Zoning laws and master plans need to consider the ability of these lands to improve water quality and buffer the population from the impacts of flooding. If necessary, these lands can be acquired or easements obtained and these areas turned into parkways. Such lands will provide nearby communities with a valuable recreational and aesthetic resource and permit natural flooding with minimal impacts to the land or structures within this area.

In order to manage flood plains effectively, they need to be clearly delineated. This can be a challenge in communities where existing flood plain maps are out of date. For instance, the flood plain maps available in Weber County were produced over 25 to 30 years ago. Since that time, stream banks have been modified and extensive development has occurred. These maps should be updated.

While most stream bank modifications impair water quality, carefully designed and implemented modifications can help preserve and enhance water quality. The U.S. Army Corp of Engineers, in cooperation with the Utah Division of Wildlife Resources, is in the process of modifying the stream banks of

Engineered Wetlands Treat Storm Water Runoff in Riverdale

Riverdale recently became Utah's latest beneficiary of an engineered wetland. The wetlands are located on the grounds of the new Wal Mart and Sam's Club. Diversified Development Realty Corp. built the wetlands to treat storm water runoff from its commercial development as well as an adjacent residential area.

The wetlands consist of three ponds: a settling pond, a planted pond and a polishing pond. Each serves a specific purpose and cleanses the water before it is released to the Weber River.

The settling pond removes sediments from the storm water. When sediment enters a stream, it covers up stream habitat that is essential for fish spawning.

The planted pond includes over 3,700 wetland plants. These plants help remove heavy metals such as lead, chrome, arsenic, copper and zinc that are generated by cars on parking lots and roads. The planted pond also removes coliform, E.coli, and streptococci bacteria introduced to the runoff from bird and animal feces.

The polishing pond acts as a purifying basin. This pond, along with the planted area, removes most of the nitrogen and phosphate compounds entering the storm water runoff from fertilized lawns.

(From a personal communication with Weber County's River Keeper, Stan Hadden.)

the Weber River near Henefer, Uintah and Peterson. The objective of these modifications is to restore the natural flood plain and enhance water quality along these degraded segments of the river. These enhancements will also restore some of the natural ground water recharge that was diminished due to past modifications.

Storm Water Discharge Permitting

Storm water runoff from industrial and urban landscapes that makes its way into the Weber River Basin's streams and rivers often contains high concentrations of various pollutants and is a significant point source of pollution. Common pollutants found in storm water runoff include pesticides, fertilizers, oils, salt, sediment and other debris.[5]

To minimize the amount of pollutants that enter the nation's water bodies through storm water runoff, the U.S. Environmental Protection Agency (EPA) initiated a two-phase process for implementation of storm water regulations. Implementation of Phase I began in 1990, and affected certain types of industry, construction sites larger than five acres, and cities with a population larger than 100,000. No communities in the Weber River Basin were impacted by Phase I.

Phase II of EPA's storm water regulations, which began implementation in 2003, will affect smaller construction sites and any area designated as "Urbanized Areas" by the U.S. Census Bureau.[6] Phase II rules will also apply to any community outside an Urbanized Area that has a population greater than 10,000 and a population density higher than 1,000 people per square mile. In Utah, this includes nearly all the communities along the Wasatch Front, Cedar City, and the Logan and St. George areas. Effected communities were required to apply for a storm water discharge permit with DWQ by March 10, 2003, and fully implement a storm water management program in compliance with the permit within five years.

Table 22 lists the communities within the Weber River Basin that are required to comply with the Phase II rules. DWQ is working closely with these communities to help them comply. In Weber County, all the communities are pooling their resources to develop a strategy to help them satisfy the new rules. By doing so, they will be able to coordinate their storm water management activities and will be allowed by EPA to apply for a group storm water discharge permit. While Park City and the surrounding area are not yet required by EPA to comply with the Phase II rules, DWQ has asked Park City and Summit County entities to voluntarily comply. Both have agreed to do so and are currently implementing programs to manage storm water.

TABLE 22
Communities Affected by EPA's Phase II Storm Water Rules

Community	Population	Population Density (people/mi^2)	In Designated Urbanized Area?
Davis County			
Bountiful	40,889	3,065	Yes
Centerville	14,509	2,416	Yes
Clearfield	25,974	3,352	Yes
Clinton	12,585	2,286	Yes
Farmington	11,662	1,558	Yes
Fruit Heights	4,701	2,134	Yes
Kaysville	19,915	2,016	Yes
Layton	58,472	2,824	Yes
North Salt Lake	8,123	1,061	Yes
South Weber	3,695	921	Yes
Sunset	5,195	3,532	Yes
Syracuse	8,947	1,079	Yes
West Bountiful	4,418	1,511	Yes
West Point	5,296	840	Yes
Woods Cross	6,405	1,783	Yes
AVERAGE	**15,386**	**2,025**	**-**
Weber County			
Farr West	2,853	530	Yes
Harrisville	3,645	1,348	Yes
Hooper	2,900	340	Yes
Marriott-Slaterville	966	196	Yes
North Ogden	15,020	2,310	Yes
Ogden	77,179	2,899	Yes
Plain City	3,264	935	Yes
Pleasant View	5,126	837	Yes
Riverdale	7,656	1,726	Yes
Roy	32,885	4,330	Yes
South Ogden	14,377	3,917	Yes
Uintah	1,123	1,120	Yes
Washington Terrace	8,551	4,477	Yes
West Haven	3,299	391	Yes
AVERAGE	**12,775**	**1,811**	**-**
Summit County			
Park City*	7,371	781	No

* Park City is not required to comply with the new Phase II rules; however, the Division of Water Quality has asked that they voluntarily comply.
(Sources: Division of Water Quality and the U.S. Census Bureau's web page: www.census.gov/main/www/cen2000.html.)

Nutrient Loading

Nutrient over-enrichment continues to be one of the leading causes of water quality impairment in the Weber River Basin. Although these nutrients (nitrogen and phosphorus) are essential to the health of aquatic ecosystems, excessive loads have resulted in the undesirable growth of aquatic vegetation and algae, resulting in oxygen depletion in several of the basin's water bodies. DWQ estimates that nutrients are the cause of over 27 percent of the basin's water quality impairments.[7]

Nutrients enter the basin's waterways primarily through wastewater treatment plant effluent. Nutrients also enter the water through septic tank systems, agricultural return flows, and runoff from heavily fertilized urban lawns and landscapes. Although it is a relatively easy process to remove nutrients from wastewater (a point source), it is not inexpensive, and controlling nutrient loads from the other non-point sources is even a bigger challenge. In areas of high septic tank densities, sewer systems need to be installed and nutrients removed at a wastewater treatment plant. On agricultural and urban landscapes, the proper application of fertilizer and efficient irrigation helps reduce the amount of these nutrients entering waterways. With a concerted effort by all those living within the basin, nutrient loads can be reduced and the quality of basin's waterways improved.

Concentrated Animal Feedlot Operations

Another water quality concern within the Weber River Basin is the impact animal feedlot operations (AFO) and concentrated animal feedlot operations (CAFO) have on water quality. These operations, where large numbers of animals are grown for meat, milk or egg production, can increase the biological waste loads introduced into rivers, lakes, and surface or ground water reservoirs. Animal manure contains nutrients, pathogens and salts.

The Utah Division of Water Quality has prepared a Utah AFO and CAFO strategy.[8] This strategy has three primary goals: (1) to restore and protect the quality of water for beneficial uses, (2) to maintain a viable and

sustainable agricultural industry, and (3) to keep the decision-making process on these issues at the state and local level. The strategy provides a five-year window for facilities of particular concern to make voluntary improvements. After this "grace" period, the initial focus of more stringent regulatory action will be directed toward those facilities located within priority watersheds with identified water quality problems, such as Chalk Creek, East Canyon Creek, Echo Creek and Silver Creek.

The first step in implementing this strategy—completing a statewide inventory of AFO and CAFO—is nearly complete. As of January 2003, the inventory has identified 1,149 AFO and 287 CAFO or potential CAFO. About 13 percent of the state's AFO (151) are located within the Weber River Basin; 15 percent of the state's CAFO or potential CAFO (44) are located in the basin.[9] Of the 151 AFO, 56 are located in the Upper Weber watershed (above Devil's Slide, primarily Summit County) and 95 are located in the Lower Weber watershed (primarily Davis, Morgan and Weber counties). Of the 44 CAFO or potential CAFO, 12 are located in the Upper Weber watershed and 32 are located in the Lower Weber watershed.

Septic Tank Densities

In some of the rural areas of the basin, advanced wastewater treatment systems have not yet been constructed and individual septic tank systems are used to dispose of domestic wastes. While septic tanks are designed to partially treat domestic waste and disperse the remaining pollutants into the natural environment in quantities that are not particularly harmful, when densities become too high, concentrations of certain pollutants (nitrogen, for example) can begin to cause problems.

Septic tanks are used extensively in certain portions of the basin. This is the case in Ogden Valley, Morgan County, the headwaters of East Canyon and Silver creeks, and other sparsely populated areas of the basin. As the population in these areas grows, the density of septic tanks will increase and eventually threaten water quality.

In Ogden Valley, the high concentration of septic tanks and the lack of a sewer collection and treatment system above Pineview Reservoir has been a concern for many years. DWQ is currently developing a TMDL for Pineview Reservoir wherein it is likely that the septic tank problem will be addressed. Accordingly, Weber County is working with a consultant to prepare a master plan for the valley, which will include wastewater collection and treatment facilities in the more developed areas of the valley.

In Morgan County, a study is underway that will analyze the impacts of septic systems. If problems are found to be serious enough, limits on septic tank densities will be implemented. Eventually, a wastewater collection and treatment system may also be required.

While existing state septic system regulations provide important guidelines for use of such systems, some within the basin feel that the regulations are inadequate to meet the needs of growing rural areas. For instance, the requirement for a new development to hook up to the sewer system only if it is located within 300 feet of an existing sewer line has little effect in Summit County where much of the new development is spread-out. Septic system guidelines that acknowledge these unique growth-related challenges should be considered.

Ground Water Contamination at Hill Air Force Base[10]

As early as 1941, the U.S. Air Force began using various chemicals to operate, repair and maintain its fleet at the Ogden Air Depot (renamed Hill Air Force Base in 1948). These chemicals included cleaners, such as the degreasing solvent Trichloroethene (TCE), and other petroleum fuel products. Prior to laws governing the disposal of such chemicals in the early 1980s, TCE was routinely dumped on the ground. Because TCE evaporates very quickly, it was believed by many that it would simply "go away." However, while much of the TCE did evaporate, some did not and it seeped into the soil where precipitation eventually forced it deeper into the ground and the shallow ground water.

Hill Air Force Base first became aware of contaminated ground water when a plume of contaminants was discovered on its northeast boundary in 1976. While this plume did not contain TCE, it did contain cis-1,2 dichoroethene (1,2-DCE) and various other contaminants associated with fuel products (1,2-DCE is a byproduct of TCE formed when it breaks down in the environment). By 1987, more contamination was discovered on the base, including four more plumes of ground water contamination, and the entire base was declared a Super Fund site. Since that time, HAFB has identified 6 additional plumes of ground water contamination, one of which contain MTBE (a relatively modern fuel additive).

Several of the contaminated plumes extend off the base into the shallow ground water beneath the surrounding communities of Clearfield, Clinton, Layton, Riverdale, Roy, South Weber and Sunset. To date, no contamination has been discovered in the drinking water systems of these communities.[11] HAFB has made efforts to inform the citizens within these areas about the contamination and identify people who might be using contaminated ground water. Where individuals using contaminated water have been found, usually for irrigation of gardens or lawns, HAFB has offered to provide them with an alternative source of clean water, at the expense of the Air Force.

As of 2002, the Air Force has spent approximately $175 million to clean up the contaminated sites that have been identified. The total cost of cleanup is estimated to be approximately $350 million. HAFB anticipates the cleanup to be completed for some sites within the next 30 years, while others are estimated to take much longer.

Water Quality Protection and Improvement Efforts

Many state and federal programs are in place to improve Utah's water quality. The Utah Pollutant Discharge Elimination System closely regulates point sources of pollution. DWQ is also working hard to eliminate nonpoint source pollution and will do so through its TMDL planning process, which is coordinated through

local watershed groups. By organizing and fostering local watershed groups, DWQ seeks the critical participation and involvement of local stakeholders.

Weber River Watershed Coalition

The Weber River Watershed Coalition was established in the spring of 2002. This group consists of approximately 50 members, representing federal, state and local agencies, as well as some local landowners. The Technical Advisory Committee meets at least quarterly to discuss activities within the watershed, progress on TMDLs, and the progress on other projects that are to improve water quality. The Coalition oversees and coordinates the efforts of eight smaller watershed groups. These groups have been organized to facilitate water quality efforts in the following sub-basins: Beaver Creek-Upper Weber, Silver Creek, East Canyon Creek, Chalk Creek, Echo Creek, Lost Creek-Middle Weber River, Ogden River, and Lower Weber.

Recently, members of the Coalition participated with DWQ in writing and distributing the *Weber River Watershed Restoration Action Strategy*. This document describes the watershed, identifies water quality issues, and describes the goals and objectives that the group would like to implement. Key goals are listed below:

- Restore water quality to meet or exceed Utah water quality standards in all impaired waterbodies.
- Protect and maintain water quality in all waterbodies that presently meet state standards.
- Enhance and improve water quality through local riparian and stream bank restoration projects.
- Assure ongoing monitoring and assessment of water quality.
- Develop and support public outreach and education efforts.
- Develop funds to support all needed water quality programs and projects within the watershed.
- Develop watershed plans for each sub-basin.

The Coalition has also facilitated the hiring of two Watershed Coordinators for active areas of the watershed, one for the East Canyon area and the other for the lower Weber drainage, below Echo Reservoir. These coordinators will assist DWQ and the Coalition in writing and coordinating grant applications for needed funding, assisting with inspecting and monitoring of projects on the ground, and helping to educate land owners on various water quality issues.

Weber Basin Water Quality Lab

Weber Basin Water Conservancy District (WBWCD) has long recognized the importance of water quality within the Weber River Basin. The district employs a dedicated staff of water quality professionals at the Weber Basin Water Quality Lab. This lab has established an extensive network of monitoring sites and takes water quality samples throughout the basin on a regular basis. Over the years, the lab has developed an extensive database of water quality data that it is able to correlate closely with the water quantity data available from WBWCD. This data is helping the Weber River Watershed Coalition and DWQ in their efforts to improve water quality within the basin.

THE ENVIRONMENT

For much of the 20th century, water management activities in the Weber River Basin focused mainly on the development and control of available water resources. In addition to numerous small, locally owned projects, three federally funded water projects were constructed in the basin: the Weber River Project, the Ogden River Project and the Weber Basin Project. At the time these projects were constructed, environmental values associated with water resources were not well understood. Since then, however, the arena in which water managers and planners operate has undergone enormous change. Environmental values are now better understood and there is an effort throughout the country and within the Weber River Basin to protect the environment from further unnecessary degradation and mitigate or restore areas impacted from past actions. Water planners and managers within the basin are and will continue to integrate environmental policies and strategies into their operations to provide balanced and comprehensive solutions to water supply problems. This will be important to the success of any future water development project or management measure.

Some of the environmental values that affect the water resources of the Weber River Basin, or have the potential to do so, include: threatened, endangered and sensitive species, wetlands and the Great Salt Lake ecosystem, instream flow maintenance, and Wild and Scenic River designation. Each is discussed briefly below.

Threatened, Endangered and Sensitive Species

In 1973, the federal Endangered Species Act (ESA) was passed by Congress to prevent plant and animal species from becoming extinct. Although the ESA has had some success, it has been widely criticized because of its negative impacts on the communities located near threatened and endangered species. Once a species is federally listed as either threatened or endangered, the ESA restricts development, land management and other activities that may impair recovery of the species.[12]

As of the year 2002, one plant species and three animal species in the Weber River Basin were listed as threatened or endangered.[13] The only endangered species located in the basin is the June Sucker, a fish that is not native to the basin and exists only in a local pond as part of a recovery effort. Its presence will not affect basin water development or management. The other three species found within the basin are the Ute Ladies-tresses (a plant species associated with wetland vegetation along the Weber River), the Ogden Rocky Mountain Snail, and the bald eagle. As many as 200 bald eagles use the shore of the Great Salt Lake, in Davis County, and riparian areas of the Weber River and East Canyon Creek as a wintering range.

To avoid the difficulties encountered when a species becomes federally listed as threatened or endangered, and to better protect Utah's plant and wildlife resources, the Utah Division of Wildlife Resources (DWR) has developed the Utah Sensitive Species List, which identifies species most vulnerable to population or habitat loss. In addition to the four species previously mentioned, 37 species that reside within the Weber River Basin are listed on Utah's Sensitive Species List. Of these, 23 are bird species, many of which have critical habitat along the east shore of the Great Salt Lake (including the American White Pelican, Osprey, Long-billed Curlew, Caspian Tern and Blue Grosbeak); 8 are mammals (including the Northern River Otter); 2 are amphibians (Columbia Spotted Frog and Western Toad); and one is a fish species (Bonneville Cutthroat Trout).[14] DWR's goal is to develop and implement appropriate conservation strategies for these species that will preclude their being listed as threatened or endangered.[15]

In 1998, the Utah Legislature created the Endangered Species Mitigation Fund (ESMF) to help protect essential habitat for Utah's threatened, endangered and sensitive species. The fund makes it possible for Utah land and water developers to continue responsible economic growth and development throughout the state while providing for the needs of various wildlife species. Through innovative, cooperative partnerships funded by the ESMF, state wildlife managers are working hard to create conservation and habitat agreements aimed at down-listing existing threatened and endangered species and avoiding the listing of other sensitive species. The ESMF provides a stable, non-lapsing revenue base which addresses the needs of Utah communities, local government and citizens who have struggled financially to comply with the requirements of federal law.[16]

Wetlands and the Great Salt Lake Ecosystem

The Great Salt Lake and surrounding wetlands make up one of the West's most biologically productive ecosystems. The Great Salt Lake ecosystem is also internationally known for its significance—not only is it an important stop on the Intermountain migratory bird route, and North America's largest water body with no outlet to the ocean, but the lake is also a significant economic resource. It supports a host of mineral extraction operations and is a major source of brine shrimp, which are used worldwide in aquaculture operations.

The water resources of the Weber River Basin are an important part of the Great Salt Lake ecosystem. Not only does Weber River and other frontal streams flow into the lake, but ground water along the Wasatch Range also gravitates toward the lake. While most of the water flows to the lake directly, some of it is filtered through the wetlands located along the lake's shore. These wetlands provide many benefits; among other things, they provide natural flood protection, improve water quality, assist in storm water management, and afford unique opportunities for recreation, education and research.

While some of the wetlands located within the Weber River Basin are protected from development within waterfowl management areas or refuges (see Figure 12), others are still vulnerable to disturbance by encroaching urban growth. To address this problem, Davis County recently completed a master plan for the shore lands within its boundaries along the Great Salt Lake. This plan provides affected communities with the tools needed to manage land use at the local level while preserving the regionally important resources of the Great Salt Lake. The plan includes maps of all the shore lands and the various uses of those lands that were identified by the public as most desirable. These include areas where development will not be allowed (land below the floodline), an agricultural buffer zone between shore lands and developable lands, and a transition zone of low-density development to high-density development.[17] In addition to Davis County's master plan, Weber County is preparing a similar plan to protect the shore lands within its boundaries. If adopted by the affected communities, these plans will go a long way in protecting these sensitive lands as sanctuaries for wildlife and the enjoyment of future generations.

Instream Flow Maintenance

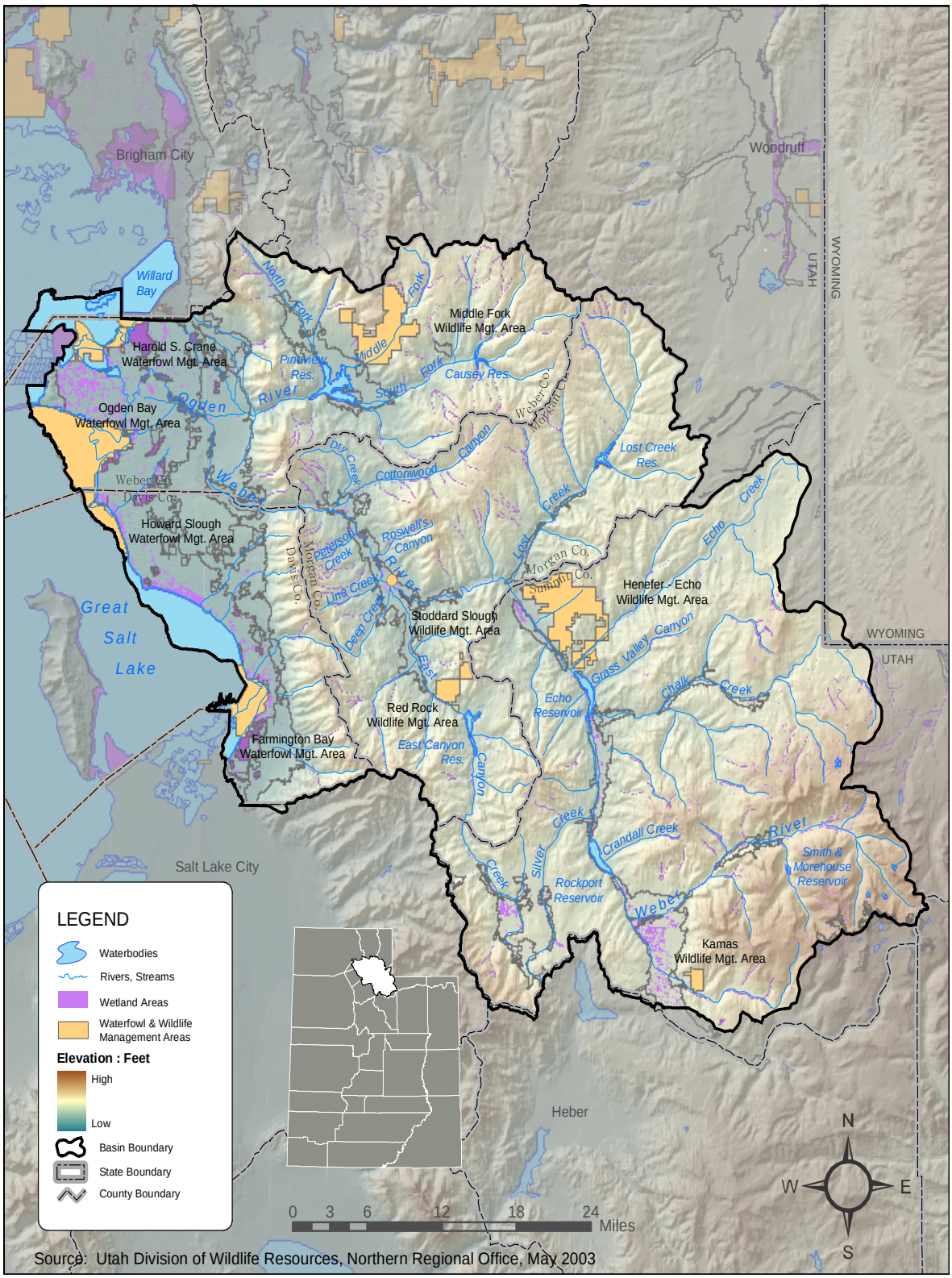
An instream flow is often defined as "free flowing water left in a stream in quantity and quality appropriate to provide for a specific purpose."[18] In general, the purpose of an instream flow is to provide habitat for fish and other aquatic wildlife; however, an instream flow may also provide water for terrestrial wildlife and livestock watering, maintain critical riparian vegetation, accommodate certain recreational purposes, or simply enhance the esthetics of the natural environment. The quantity and timing of instream flows vary with each purpose and are not necessarily the same as a minimum flow.

In Utah, there are several ways to obtain instream flows; these are listed below:

- Instream Flow Agreements – When water storage and diversion facilities are constructed, minimum instream flows are often negotiated among the various water users as a means of mitigating negative impacts of the project to fish and wildlife values. These agreements often describe conditions where the minimum flows may be compromised and have no legal mechanism of enforcement. Instream flow agreements are the most common form of stream flow maintenance in Utah.

FIGURE 12

Waterfowl & Wildlife Management Areas



Source: Utah Division of Wildlife Resources, Northern Regional Office, May 2003

- Conditions on New Water Rights Appropriations – Since 1971, the State Engineer has had the authority to place a condition on the approval of a water right application if, in his judgment, approval of the full requested right would "unreasonably affect public recreation or the natural stream environment." In other words, the State Engineer can reject (or reduce the amount of) a new appropriation or reject a change application in order to reserve sufficient flow for recreation or the environment. As of the end of 2003, there were no instances in the Weber River Basin where the State Engineer was required to exercise this authority.
- Conditions of Permits or Licenses – Hydroelectric facilities must receive a license from the Federal Energy Regulatory Commission to operate. Alterations to streams must receive a permit from the Utah Division of Water Rights. Before a license or permit is issued or renewed, the public is given the opportunity to comment. If this process identifies instream flows as critical to other uses of the water, such as wildlife habitat, these flows may become part of the permit or license conditions.
- Instream Flow Water Rights – In 1986 the Utah Legislature amended the water rights law of the state to allow the Utah Division of Wildlife Resources to file for changes of a perfected water right that would provide sufficient instream flow for fish propagation. These water rights may be obtained through purchase, lease, agreement, gift, exchange or contribution. Acquisition of such flows must be approved by the legislature before the State Engineer can make a determination. Later, the Utah Division of State Parks and Recreation was given the same authority.

Table 23 lists the only known instances of instream flows within the Weber River Basin. These flows are all agreements that are part of the federally funded Weber Basin Project, and, therefore, deal with stream segments near Weber Basin Project facilities. Although these instream flow agreements exist, wildlife managers have expressed concern that in some locations these flows are not always maintained.

In addition to the importance of maintaining instream flows, wildlife managers, water quality officials and recreationists have expressed concern that rapid fluctuations in stream flow occasionally

TABLE 23
Minimum Instream Flow Agreements in the Weber River Basin

Reservoir or Diversion Dam	River	Min. Instream Flow (cfs)
Pineview*	Ogden	10
Rockport Lake	Weber	25
East Canyon*	East Canyon Creek	5
Echo	Weber	0
Lost Creek*	Lost Creek	8
Causey*	South Fork Ogden	25
Smith and Morehouse	Morehouse Creek	5
Stoddard Diversion†	Weber	15-30
Slaterville Diversion‡	Weber	20-150

* Minimum flows can be less than shown if total inflows into the reservoir are less.
† Minimum flow applies at a point approximately 200 feet below the diversion dam where a canal bypass returns water to the river. The minimum flow is normally 30 cfs, but may be reduced to 15 cfs when more flow is necessary to operate the Gateway Powerplant at minimum capacity.
‡ Varies according to season: 20 cfs (Dec. 11-Feb. 28); 50 cfs (Mar. 1-April 10); 135 cfs (Apr. 11-June 15); 80 cfs (June 16-Oct. 15); and 150 cfs (Oct. 16-Dec. 10). (Source: "Operating Criteria for Fish and Wildlife Purposes" provided to the Utah Division of Wildlife Resources by Weber Basin Water Conservancy District, May 1995.)

occur on the Weber River system. These are most likely the result of operational procedures at various reservoirs and are believed to be detrimental to aquatic life and water quality in the effected streams. When significant changes in reservoir releases are required, these should be coordinated with other affected stakeholders to assure that they occur in a way that is not damaging to the river corridor.

Wild and Scenic River Designation

The Wild and Scenic Rivers Act (WSRA) of 1968 states that, "certain selected rivers of the nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."[19] Only Congress has the authority to designate a stream or river segment as "Wild and Scenic." In most cases, such designation would prevent construction of flow modifying structures or other facilities on such river segments. The area for which development is limited along a wild and scenic river varies from river to river but includes at least the area within one-quarter mile of the ordinary high water mark on either side of the river.

Currently there are no rivers in the Weber River Basin with the Wild and Scenic River designation. In recent years, however, national forests and other federal agencies have made inventories of streams for consideration as wild and scenic rivers and found numerous stretches to be eligible. Table 24 shows the stream segments that the Wasatch-Cache National Forest recently deemed eligible for Wild &

TABLE 24
Wasatch-Cache National Forest Eligible Wild & Scenic Rivers

River Name and Eligible Segment	Classification
Beaver Creek: Source to Forest boundary	Recreational
Left Fork South Fork Ogden River: Frost Canyon/Bear Canyon Confluence to Causey Reservoir	Wild
Middle Fork Weber River: Source to Forest boundary	Wild
Main Fork Weber River: Source to Forest boundary	Scenic

Source: Wasatch-Cache National Forest, Final Environmental Impact Statement, (U.S. Forest Service: Salt Lake City, 2003), 3-375.

Scenic River designation. The Forest will now undertake further study to determine whether these segments are suitable for designation.

OBTAINING BALANCE BETWEEN COMPETING VALUES

In recent decades, water quality and environmental values have emerged as important players in the water resources arena. Taking their place alongside the traditional role of supplying the public with adequate water supply, these important values have changed the landscape within which water planners and managers operate. Water resources are now subject to numerous federal and state laws which are intended to help keep water clean and protect the environment.

Water quality and environmental laws help sustain the beneficial use of water and bring valuable balance to the water resources arena, where growing needs are causing increased competition and are often conflicting in nature. While this balancing act is not easy, if properly orchestrated, it will lead to better water planning and management, higher quality water, and a healthier and more enjoyable environment.

Water planners and managers, local leaders, and interested individuals within the Weber River Basin all play important roles in the management of the basin's water resources. By working closely together, they can help meet future water resources challenges. Following the spirit of the pioneers who first settled the basin, they too can assure a promising future for subsequent generations.

NOTES

[1] A TMDL sets limits on pollution sources and outlines how these limits will be met through implementation of best available technologies for point sources and best management practices for nonpoint sources. For more information, see U.S. Environmental Protection Agency, "Total Maximum Daily Load (TMDL) Program." Retrieved from EPA's Internet web page: www.epa.gov/owow/Total Maximum Daily Load/intro.html, March, 2000.

[2] Green, Shane, "Watershed Progress Report: Chalk Creek Watershed," (Coalville: NRCS, 2001).

[3] Weber River Watershed Coalition, *Weber River Watershed Restoration Action Strategy,* (Salt Lake City: Division of Water Quality, 2003).

[4] Utah Division of Water Quality, *Weber River Watershed Management Water Quality Assessment Report,* (Salt Lake City: Dept. of Environmental Quality, 2000), 21. This report is also available online at the Division of Water Quality's web page: www.waterquality.utah.gov.

[5] U.S. Environmental Protection Agency, "Storm Water Phase II Final Rule," Fact Sheet 1.0, (Roanoke, Virginia: EPA, 2000), 1. This fact sheet is a concise, four-page description of the Phase II rules, their intent and who is required to comply. A copy of this and other fact sheets can be obtained from EPA's web page at: www.epa.gov/owm/sw/phase2.

[6] U.S. Census Bureau, "United States Census 2000." Retrieved from the U.S. Census Bureau's Internet web page: http://www.census.gov/main/www/cen2000.html, January 2003. As defined by the Bureau, an urbanized area is "an area consisting of a central place(s) and adjacent territory with a general population density of at least 1,000 people per square mile of land area that together have a minimum residential population of at least 50,000 people."

[7] Utah Division of Water Quality, 2000, 19.

[8] Utah Department of Agriculture and Food, "Animal Feeding operations... A Utah Strategy: How Will it Affect You?," (Salt Lake City: 1999). A brochure prepared in cooperation with EPA, USDA, NRCS, Utah Department of Environmental Quality, Utah Association of Conservation Districts, and USU Extension.

[9] Mark Peterson, *Annual AFO/CAFO Inventory and Assessment Summary,* an unpublished report by the Utah Farm Bureau, February 6, 2003.

[10] Personal communications with Steve Hicken, Remedial Investigations Program Manager, Restoration Division, HAFB. Some of the information in this section was derived from an "Information Packet" which was distributed at an InfoFair hosted by the Air Force in Clearfield on November 7, 2002.

[11] Drinking water in these communities is obtained from a deep confined aquifer and from surface water sources through the WBWCD. The deep aquifer is separated from the shallow aquifer by a thick clay layer, which serves as a barrier, which has thus far prevented the contamination from mingling with the drinking water.

[12] Utah Division of Wildlife Resources, *Species on the Edge Benefits to Local Communities,* (Salt Lake City: Dept. of Natural Resources, 2002), 7.

[13] Utah Division of Wildlife Resources, "Federal Threatened and Endangered List by County," (Salt Lake City: Dept. of Natural Resources, Sept. 25, 2003). This and other lists are updated frequently and can be obtained online at the division's Conservation Data Center: http://dwrcdc.nr.utah.gov/ucdc.

[14] Utah Division of Wildlife Resources, "Utah's Sensitive Species List," (Salt Lake City: Dept. of Natural Resources, December 18, 2003).

[15] Utah Division of Wildlife Resources, 2002.

[16] Ibid, 3 & 4.

[17] Davis County Council of Governments, *Davis County Shorelands Comprehensive Land Use Master Plan,* (Farmington: 2001), 2, 12. This plan seeks to conserve and preserve the unique values associated with the lands along the east shore of the Great Salt Lake, and was prepared in partnership with The Nature Conservancy and Envision Utah.

[18] Holden, Mark A., "The Importance of Instream Flow and Recreational Needs in State Water Planning," transcript of a talk given at the Sixteenth Annual Conference, Utah Section, American Water Resources Association, April 21, 1988.

[19] U.S. Congress, *Wild and Scenic Rivers Act, P.L. 90-542,* as amended, 16 U.S.C. 1271-1287, (Washington D.C.: Government Printing Office, 1986).